

RESPONSE UNDER 37 C.F.R. § 1.111
Attorney Docket No.: Q85660
U.S. Application No.: 10/521,311

REMARKS

This Response, filed in reply to the Office Action dated October 2, 2007, is believed to be fully responsive to each point of the rejection raised therein. Accordingly, favorable reconsideration and allowance of the subject application are respectfully requested.

Claims 1-71 are all the claims pending in the application. Claims 38-71 are withdrawn from Examination. Claims 1-37 are under examination.

Examiner Arguments

Applicants note that the Examiner indicated on page 7 of the Office action that “Applicants’ arguments with respect to claims 1-37 have been considered but are moot in view of the new grounds of rejection.” However, only claims 3-9 and 27-29 are newly rejection under new ground. Therefore, Applicants respectfully request that the Examiner considers the arguments set forth below regarding all the claims.

Election Restriction

Applicants acknowledge with thanks the Examiner acknowledgment of the election of Group 1, claim 1-37.

Rejection under 35 U.S.C. § 102

Claims 1, 2, 10-26 and 31-37 are rejected under 35 U.S.C. § 102 (e) as being anticipated by Jeon et al. (U.S. Patent No. 6,586,349). Applicants respectfully traverse this rejection.

The claimed invention relates to:

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A semiconductor device comprising an insulating film structure which electrically insulates a conductive region from a silicon region,

wherein said insulating film structure extends on said silicon region and under said conductive region, said insulating film structure further comprising at least one silicate region composed of a silicon oxide containing at least one metal element thermally diffused.

On the other hand, Jeon relates to a fabrication of **composite dielectric material** layers in semiconductor devices. Figures 1-5 depict different composite dielectric material combinations to fabricate this composite dielectric. For example figure 1 shows a composite dielectric 110. The composite dielectric includes seven (7) sub-layers (120, 122, 124, 126, 128, 130, and 132). Each of the sub-layers contain several part of different dielectric material. For example, Jeon teaches “ the **composite dielectric material** layer (fig 1, item 110) includes a lowermost sub-layer (120) and uppermost sub-layer (132) each of which contain zero parts of the first dielectric and 100 parts of the second dielectric material.” Further, Jeon teaches sub-layers(122 and 130)comprise 25 parts of the first dielectric material and 75 parts of the second dielectric material; sub-layers (124 and 128) comprise 75 parts of the first dielectric material, and 25 parts of the second dielectric material; sub-layer 126 comprises of 100 parts of the first dielectric material and zero parts of the second dielectric material. (see Col. 8, lines 1, et seq.). This resulting product or device from the fabrication method disclosed by Jeon differs from the novel device of the application at bar.

Jeon’s device differs from the claimed invention for many reasons and thus could not anticipate the invention(s) as claimed.

First, Jeon does not disclosed the claimed limitation as in claim 1: “a semiconductor device comprising of an **insulation film** , said insulating film structure extends on said silicon region and under said conductive region, said insulating film structure further comprising at least one silicate region composed of a silicon oxide **containing at least one metal element thermally diffused.**” (see **claim 1**). Accordingly, Applicants submit that Jeon does not

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anticipate claim 1. If the Examiner maintains the rejection, Applicants respectfully requests the Examiner to specify the paragraphs in which Jeon discloses the feature “...an insulating film structure further comprising at least one silicate region composed of a silicon oxide **containing at least one metal element thermally diffused.**” Applicants further submit that the Examiner needs to show the same product in order to maintain a rejection based on product-by -process. This is further discussed below. Applicants submit the composite dielectric disclosed by Jeon is neither the same nor similar to the claimed invention.

Second, Jeon does not disclose the limitation of claim 3, “wherein said least one silicon oxide region composed of a silicon oxide not containing said at least one metal element, at least one metal rich region having high concentration of said at least one metal element, and said at least one silicate region which is located between said silicon oxide region and said metal rich region and has lower concentration of said at least one metal element than that of said metal rich region.” In contrast, Jeon teaches that sub-layers 120 and 132 (the lowermost and the uppermost sub-layers, respectively) are made of the same dielectric material. It follows that the lowermost and uppermost sub-layers have the same level of metal element in contrast with the claimed invention and as claimed in claim 3. Applicants submit that the reference does not anticipate, or even suggest the claim limitation.

Third, Jeon fails to disclose that, “said silicate region has composition modulation in which composition of said at least one metal element increases as closer to said metal rich region and decreases as closer to said silicon oxide region.” This limitation is clearly recited in many of the claims, see for example claim 4.

Fourth, Jeon fails to disclose that “wherein a source of said at least one metal element subjected to thermal diffusion comprises a metal layer deposited on a surface of a base silicon oxide film extending on said silicon region in atmosphere with residual oxygen partial pressure of 1×10^{-6} Torr or less. See for example claim 12.

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Applicants respectfully note that a claim is anticipated under 35 U.S.C. § 102 (b) only if each of the elements as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. Further the identical invention must be shown in as complete detail as is contained in the claim. Finally, the elements must be arranged as required by the claim. Manual of Patent Examination and Procedures (MPEP) section 2131.

Here, Jeon fails to teach the limitations as claimed in claim 1 and many of the dependent claims as indicated above. Further, the device fabricated by Jeon does not anticipate or result in the semiconductor device comprising the insulating film as claimed in the current invention. The device of Jeon is a device wherein the substrate is comprised of different sub-layers. **In the current invention, the insulating film is not made of sub-layers.** This is an important distinction, which needs to be considered by the Examiner. In sharp contrast, the current invention is an insulating film in which at least one metal element is diffused. Said diffusion under controlled conditions resulting in an insulation film wherein **said silicate region has composition modulation in which composition of said at least one metal element increases as closer to said metal rich region and decreases as closer to said silicon oxide region**

Product by process limitations

The Examiner also rejected claims 1, 12-15, 18-21, 22-24, and 31 as pertaining to “product by process” limitations. Applicants disagree and assert the following arguments:

This rejection is improper because the Examiner did not make a showing in the prior art of a product that is the same or obvious as compared to the current invention. The Jeon reference is not the same as the claimed invention nor does Jeon render the claims obvious or even suggest such insulating film as recited in the claims. Applicants note that the MPEP, section 2113, entitled, “product-by-process claims are not limited to the manipulations of the recited steps, only the structure implied by the steps” states “even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product

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itself. The patentability of a product does not depend on its method of production. **If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.”** *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).” (emphasis added) Further it states, **“the structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art...**where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979).”

The Patent Office bears the burden (albeit a lesser burden) of proof to make a prima facie case. It is incumbent on the examiner to provide a rationale tending to show that the claimed product appears to be the **same or similar** to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. *In re Marosi*, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983).

Here, the burden never shifted. The Examiner did not show the same of even a similar product (see above for differences between Jeon and the claimed invention). Since the insulating film sought to be patented is not the same or rendered obvious by the cited prior art Jeon, the rejection is improper. Therefore, Applicants respectfully request that the rejection is withdrawn .

Claim Rejections 35 U.S.C. § 103

The Examiner rejected Claims 3-9 and 27-29 under 35 U.S.C. § 103 (a) as being unpatentable over Jeon. Applicants respectfully traverse this rejection.

The Examiner asserts that “Jeon shows all of the elements of the claims except the specified parameters of the claims.” Applicants respectfully submit that claims 3-9 and 27-29 are patentable at least by virtue of their dependency on claim 1. In addition, Applicants respectfully submit that Jeon does not teach the invention as described in claim 1 and discussed above.

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Moreover, the Examiner correctly concedes that Jeon does not teach the claimed invention as described in the claims 3-9 and 27-29. However, the Examiner maintains that “ it would have been obvious to one of ordinary skilled in the art at the time the invention was made to from the device parameters such as the concentration distribution and composition modulation having the desired value, since it has been held that discovering an optimum value of a result effective variable involves routing skill in the art. Citing in support *In re Boesch*.

Applicants respectfully submit that the Examiner’s reliance on this case law is misplaced. A proper reading of this case law would reveal that the prior art *itself* must disclose that the variable is result effective; the Examiner cannot simply make the statement in hindsight. As described in MPEP § 2144.05, “a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.). See also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the formation of an alloy).

In both of the above cases relating to the result-effective variable, the courts looked to the **prior art** to determine whether a variable had been recognized as a result-effective variable. In this case, Jeon does not recognize an insulating film structure comprising at least one silicon

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oxide region composed of a silicon oxide not containing at least one metal element , at lest one metal rich region having high concentration of metal as a result-effective variable.

Moreover, Applicants respectfully remind the Examiner that the Examiner bears the initial burden of establishing a *prima facie* case of obviousness, which the applicant must be then rebut. Applicants also remind the Examiner that in view of *KSR v. Teleflex* and the new USPTO guidelines, some reason should be provided for the rejection under 35 U.S.C. § 103. Applicants respectfully submit that the Examiner did not established a prima facie case of obvious. Consequently, Applicants respectfully request the withdrawal of this rejection and earnestly solicits the allowance of all the claims in the application at bar.

The Examiner rejected Claim 30 under 35 U.S.C. § 103(a) as being unpatentable over Jeon as applied to claim 1 above, and further in view of Green. Applicants respectfully traverse this rejection.

As pointed out above, Jeon does not teach “a semiconductor device comprising of an **insulation film**, said insulating film structure extends on said silicon region and under said conductive region, said insulating film structure further comprising at least one silicate region composed of a silicon oxide **containing at least one metal element thermally diffused.**” Instead, Jeon relates to a fabrication of **composite dielectric material** layers in semiconductor devices. Figures 1-5 depict different composite dielectric material combinations to fabricate this composite dielectric. For example figure 1 shows a composite dielectric 110. The composite dielectric includes seven (7) sub-layers (120, 122, 124, 126, 128, 130, and 132). Each of the sub-layers contain several part of different dielectric material. For example, Jeon teaches “ the **composite dielectric material** layer (fig 1, item 110) includes a lowermost sub-layer (120) and uppermost sub-layer (132) each of which contain zero parts of the first dielectric and 100 parts of

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the second dielectric material.” Further, Jeon teaches sub-layers(122 and 130)comprise 25 parts of the first dielectric material and 75 parts of the second dielectric material; sub-layers (124 and 128) comprise 75 parts of the first dielectric material, and 25 parts of the second dielectric material; sub-layer 126 comprises of 100 parts of the first dielectric material and zero parts of the second dielectric material. (see Col. 8, lines 1, et seq.). Since sub-layers 120 and 132 (the lowermost and the uppermost sub-layers, respectively) is made of the same dielectric material, it follows that the lowermost and uppermost sub-layers have same level of metal element in contrast with the present invention as claimed in claim 1. However, Green does not remedy the deficiencies of Jeon. Both Jeon and Green, singly or in combination fails to teach the silicon oxide containing at least one metal element thermally diffused. Therefore, Applicants contend that the combination of Jeon in view of Green does not render obvious the claim invention. Applicants respectfully request the reconsideration and allowance of claim 30.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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